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ABSTRACT

Connectivity on the Internet through the use of World Wide Web browsers is becoming commonplace in the classroom, at home, and in the office. The term, "power pedagogy" refers to any set of instructional methods designed to increase faculty productivity and to accommodate more students with existing facilities. This paper examines the use of the Web to supplement traditional instruction, focusing on use of the Web as an intranet teaching tool that establishes an extension of the regular classroom. At Coastal Carolina University (CCU) in South Carolina, new forms of technology-based curriculum delivery and student learning are being considered. Individuals with University computing accounts can access Usenet newsgroups through a public news server. Faculty can set up e-mail mailing lists to broadcast messages to all students registered in specific classes, majors, departments, or academic organizations. E-mail is also used for the submission and critique of assignments and similar work. Course-specific Web pages are used to facilitate posting of grades, distribution of announcements and class notes/handouts, course policies and course syllabi, and other similar material. Internet-based lab work is conducted by students and faculty in some departments of the School of Science. Advantages and disadvantages of technology-based instruction are discussed. (Contains 10 references.) (AEF)

Power Pedagogy: Integrating Technology in the Classroom

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Abstract

Classroom instruction has come a long way within the past decade. Connectivity on the Internet through the use of WWW browsers is becoming commonplace in the classroom, at home, and in the office. In this paper, the author looks at the use of the Web to supplement traditional instruction. The focus is on the use of Web pages as an intranet teaching tool that establishes an extension of the regular classroom. This facilitates distribution of electronic supplements to students in a class, as well as the collection of survey responses to regular class assessment by the students. On the internet side, Web pages provide a medium for distance learning and an advertising tool to attract prospective students. Some pointers and suggestions from the author's experiences are also discussed.

1. Introduction

One cannot help but stop and notice the amount of change that continues to occur in today's classroom instruction. It seems like only a few years ago that there was only one major classroom model. This was the traditional classroom model that required regular meeting between the instructor and the students at a prearranged site or room. Changes in technology are apparent not only in today's classroom. It is also impacting instructors, students, curriculum, and teaching methods.

What, then, is "power pedagogy"? The term refers to any set of instructional methods designed to increase faculty productivity and to accommodate more students with existing facilities. This is in line with the "do more with less" (Bothun, 1996) dilemma facing most colleges and universities. With these methods come a set of technology-based tools, hence the phrase in the title, "integrating technology in the classroom." But perhaps even more noticeable than the use of technology in the classroom is the use of technology to augment the traditional classroom. Most people refer to this extension of the classroom as "distance education" (Bothun, 1996 and Chizmar & Williams, 1996) or "virtual classrooms" (Juliano & Sheel, 1995). In this scenario, students are located in one place while their teacher(s), peers, or other instructional resources are located in another. A number of different technologies are involved and, depending on the arrangement, it can be useful in a wide range of learning situations. The most common tool used to implement this is the World Wide Web. In the next section, we briefly discuss the technology that makes the Web work and then follow it up with its impact on technology-based instruction.

2. Telecommunications and Network Technology

Traditional classroom instruction through print media could have been considered power pedagogy even up to a few decades ago. As an extension to the Socratic method of teaching, print media facilitated the dissemination of information. The next step in enhancing the traditional classroom model was to include the use of audio technologies, such as radio, audio cassettes, and, of course, the telephone. However, with the exception of the telephone, audio-based distance learning is noninteractive. Now, when audio is combined with video, as in the case of television, the result can be similar to that of interpersonal instruction. However, again, there is no potential for interaction, unless additional technology is used. Despite this drawback, television-based distance education is one of the fastest-growing segments of the industry.

The next level of sophistication is to use satellite and cable. Satellite technology increases the instructional coverage area significantly (Wu, Miller, Pritchard, & Pickholtz, 1994). In a similar but smaller extent, the use of fiber-optic and coaxial cable to distribute video materials in cable television systems facilitate receiving programs from many sources, including satellite, for distribution to any subscriber. In this arrangement, the instructor conducts a class session "live" in front of a video camera. The course is then uplinked to a satellite, from which it is sent to the subscribing schools' satellite dishes. Such a course may then be sent out to additional learning sites over cable. This can further be improved through the support of two-way teleconferencing. Combining two-way audio and two-way video demands so much bandwidth to transmit. However, this also extends the traditional classroom by allowing students to ask questions or respond to the teacher in real time.

The use of network technology is another way to enhance traditional education. This encompasses the use of electronic-mail programs that allow users to send and receive information on a non-real-time basis and the use of the Internet to share and exchange information. The popularity of network technology stems from the fact that it is relatively easy to implement. All users need is a computer account, or a modem and a personal computer. This is fairly minimal equipment, considering that one can share and access assignments, critiques, and much more across the country and even around the world. This is precisely why connectivity on the Internet through the use of Web browsers is becoming commonplace in the classroom, at home, and in the office.

3. Power Pedogogy = Technology-Based Instruction

Only recently has technology-based instruction been gaining recognition at Coastal Carolina University (CCU) in South Carolina. The campus network currently supports over 2,300 users. Web

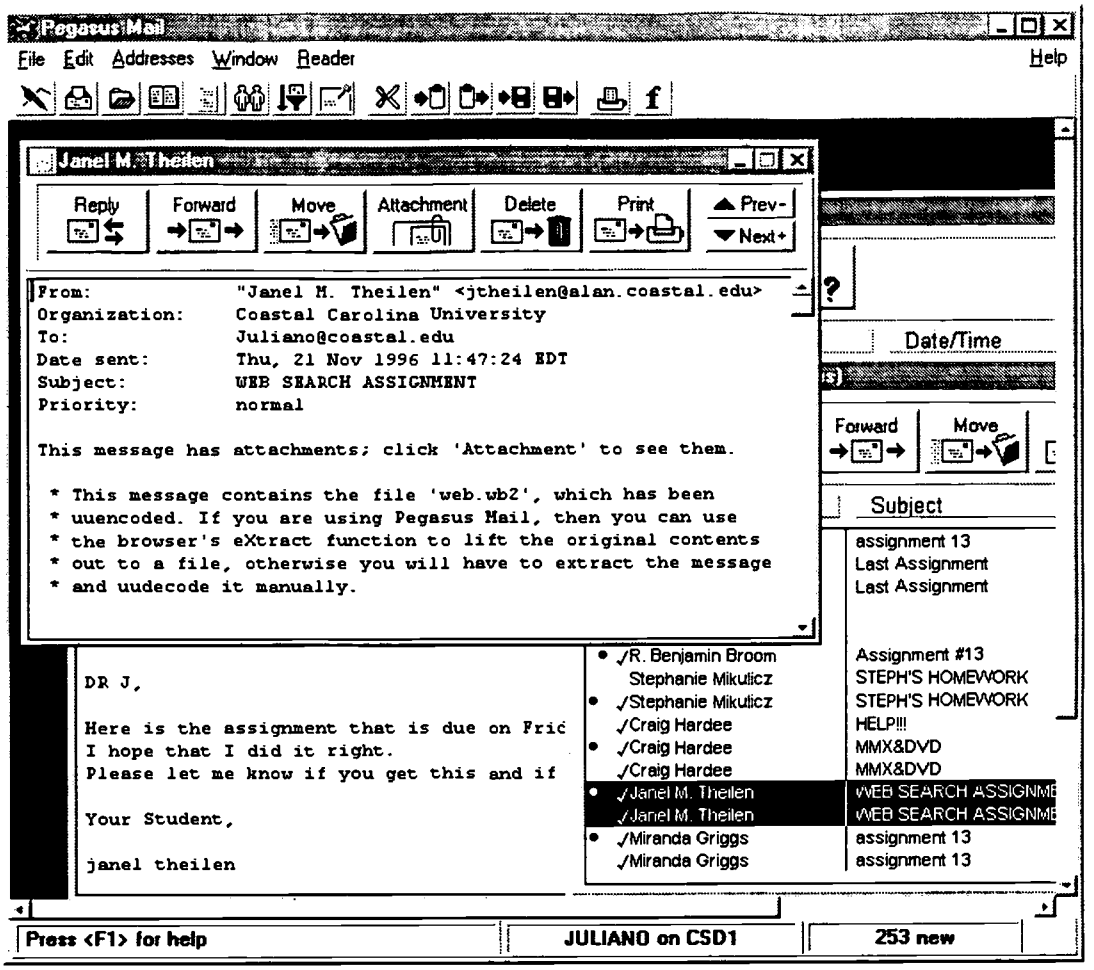

Figure 1 Submitting assignments as e-mail attachments in Pegasus Mail for Windows.

access was a service made available to students, faculty, and staff less than two years ago. With its introduction, new forms of curriculum delivery and student learning that centers on the use of technology are being considered. Here is a list, adopted from Chizmar & Williams (1996), indicating some of the learning activities possible when employing technology-based instruction:

- private newsgroups for each class
- electronic-mail collaboration between students, between students and faculty, and between faculty
- electronic mail submission and critique of work
- video- and/or teleconferencing
- electronic posting of grades, class handouts, notices, schedules, etc.
- electronic exhibit areas for class projects
- Internet-based lab work and research projects
- Internet-wide critique of work

How does CCU implement these activities in our classes? As of this writing private newsgroups are not supported, but individuals with University computing accounts can access Usenet newsgroups through a public news server. E-mail collaboration is facilitated by the Majordomo mailing list manager on a DEC Alpha minicomputer running Digital Unix. This mailing list manager allows

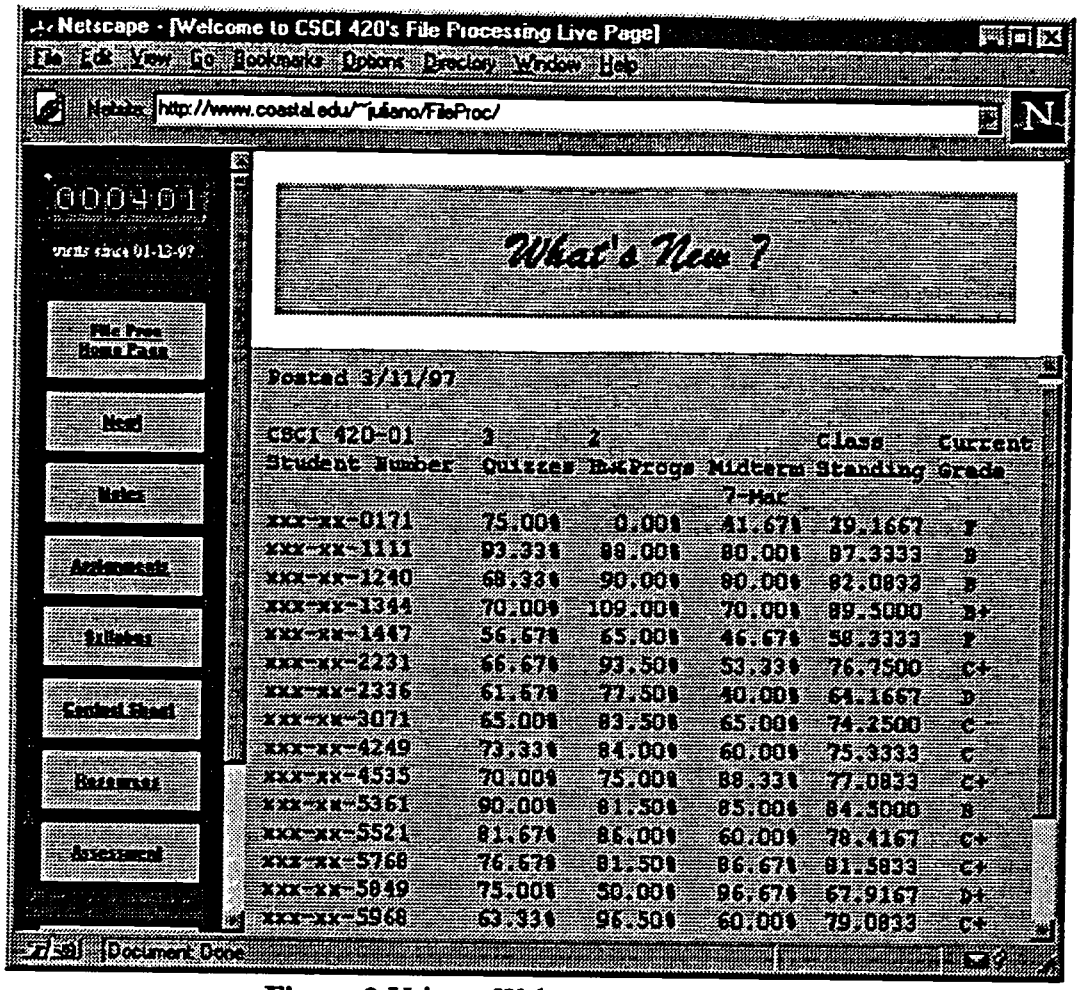

Figure 2 Using a Web page to post grades.

faculty to set up their class mailing lists so e-mail messages can be broadcast to all students registered in that class and the professor. The package was also used to set up mailing lists for specific majors, faculty in specific departments, as well as academic organizations and clubs. Several departments have also set up jobs mailing lists for their students. Major-specific job openings, whether local, regional, or national, are distributed through this medium. Most faculty use Pegasus Mail for Windows running on the University's Academic LAN when sharing (drafts of) documents that pertain to a project they are collaborating in, or even working documents for a University committee they are participating in.

E-mail is also used for the submission and critique of assignments and similar work. For example, in the Department of Computer Science, all courses that incorporate programming in the Unix environment require that these assignments be submitted via e-mail. In our Computer Applications class, students are sometimes asked to submit their wordprocessing or spreadsheet assignments as attachments in Pegasus (see Figure 1). Comments, criticisms and suggestions can then be sent back to the students via e-mail. CCU also offers some M.B.A. courses in its joint program with Winthrop University through distance learning (DL). A DL-enhanced classroom housed in the CCU campus is used. The facility supports two-way teleconferencing and has proven quite successful.

The last four items in the list above are best implemented as Web pages or components of Web pages. As an example, the author uses course-specific web pages to facilitate posting of grades (see

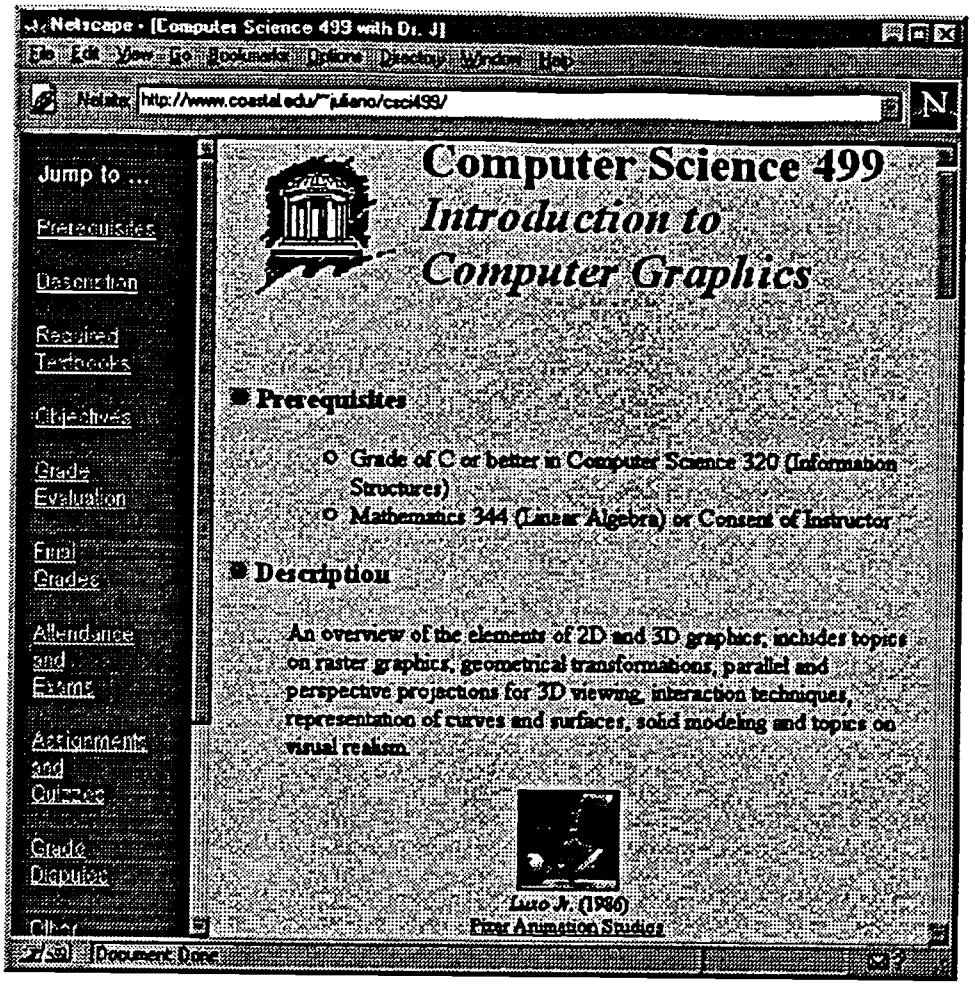

Figure 3 Presenting course syllabi on the Web.

Figure 2), distribution of announcements and class notes/handouts, course policies and course syllabi (see Figure 3), and other similar material. The author is also planning to use Web pages to feature and exhibit Computer Graphics class projects as well. Internet-based lab work is conducted on a regular basis by students and faculty in some departments of the School of Science. Through a web browser, one has access to real time data that pertains to the weather, the oceans, and other scientific information. Live stream audio and video allows the viewing of current events, on-line speeches and debates, and even concerts. Lastly, Internet-wide critique of work is done by some faculty by providing HTML versions (also plain text, postscript, or Adobe *.pdf files) of their papers or articles for review by other people who access the Internet. Of course, various combinations of the above activities are also possible.

When is technology-based instruction appropriate? Using the time and place categorization by Chizmar & Williams (1996), technology-based instruction seems most appropriate in all categories except the same-time/same-place category. This means non-traditional learning environments where the time and place of instruction are not both the same for educators and learners. Here are some examples:

- To mitigate geographical isolation in same-time/different-place scenarios. People in remote, rural areas either are simply unable to attend school or have access to only a very limited curriculum offering. Technology-based instruction (and distance learning, in particular) facilitates full participation in the educational process.

- To resolve scheduling conflicts that are characteristic of different-time/different-place situations. Adult learners in particular often deal with numerous scheduling conflicts: job, family, and other commitments can make it difficult for them to find the time to attend conventional classes. With distance education, such learners have a greater degree of control over their own educational process and pace.

- To distribute scarce, or unique, instructional resources. Rare and precious art, data collected by NASA, specific regional information from the Census Bureau, current exchange rates, and even stock market quotes are just a few examples of information that can be accessed from the Web.

Technology-based instruction facilitates broad distribution of curricula and related materials. In essence, it "alters the limitations of time and space" (Chizmar & Williams, 1996).

4. Discussion

The integration of instructional technology in the classroom has been met with both excitement and resentment by various University constituents. The general reaction people have for those who readily embrace technology is one claiming these believers "have too much time in their hands." Another reaction is one of doubt that this technology will ever last for a reasonable amount of time as developments and modifications occur at an exponential rate. On the opposite side of the spectrum, those who do not readily integrate technology in instructional environment are generally labeled as "set in their ways" to the harsher "afraid of change." Those in administration also fall in one of these two extremes: those who favor technology tend to do so for political and/or P.R. reasons, whereas those who do not favor technology tend to do so because of the initial costs involved.

Since "power pedagogy" refers to any set of instructional methods designed to increase faculty productivity and to accommodate more students with existing facilities, we can use the list of advantages and disadvantages of using instructional technology outlined by Bothun (1996) based on his experience and involvement in the development and maintenance of networked courseware at the University of Oregon. These are presented next with some comments regarding the author's own experiences and observations at CCU.

4.1 Advantages of Power Pedagogy

"1. Technology-based instruction facilitates direct manipulation of real data using real analysis programs as part of the regular classroom presentation. Furthermore, it allows the professor to customize a curriculum to center on his or her particular area of expertise." (Bothun, 1996)

As indicated earlier, Internet-based lab work is conducted regularly by some Department of the School of Science. In particular, a Marine Science professor teaching Environmental Ecology uses a web browser and computer projection equipment in his lectures to show real time satellite data about the earth, currently changing weather, etc. to illustrate and emphasize concepts introduced and discussed in class. Similarly, classes can tune in "live" on the keynote speaker's address at the recent JavaOne Conference in San Francisco or the landing of the space shuttle after completing its most recent mission - depending on how these pertain to course content. Currently, CCU has not reached the point where personal research data of faculty are made available and accessible to the students as part of the curriculum. The author predicts that this direct integration of research into teaching will occur soon.

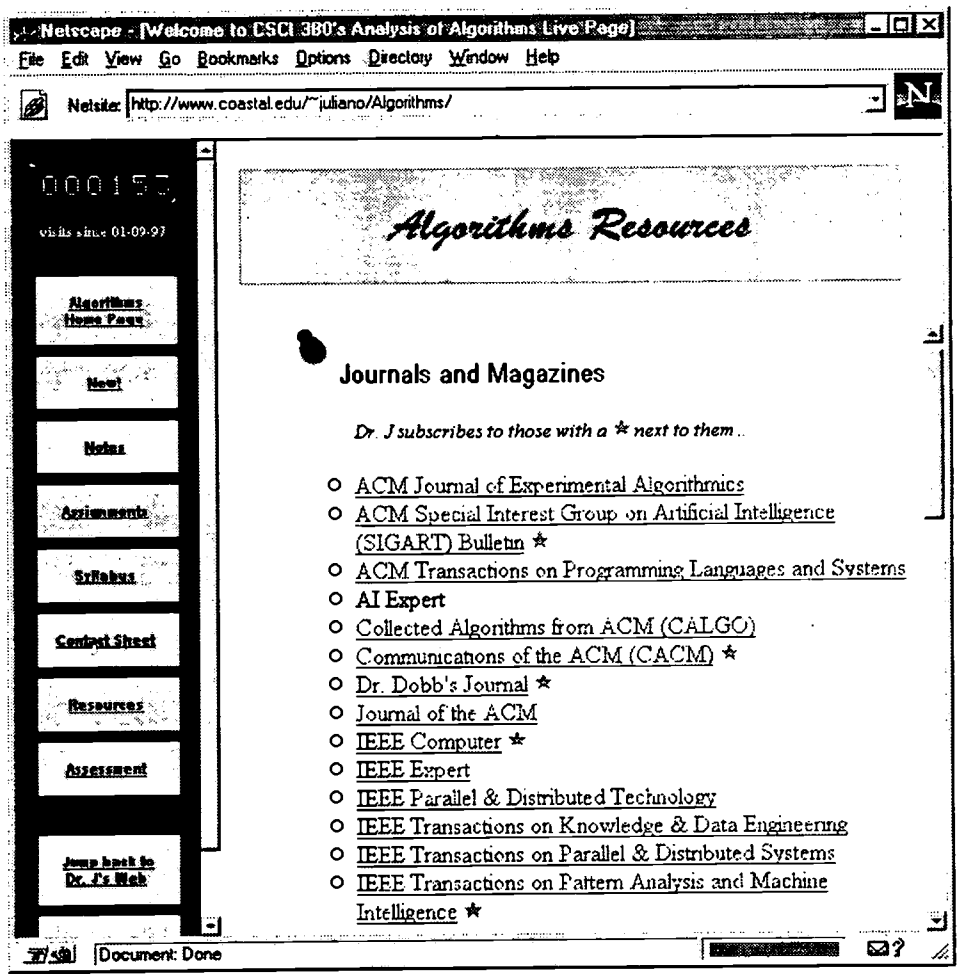

Figure 4 Using Web pages to provide a list of useful resources for a course.

"2. Software, such as web browsers, allows for an extremely convenient way to organize, prepare, and present lectures. One can easily integrate text with graphics and animation into one seamless presentation." (Bothun, 1996)

The use of overhead projectors and computer projection systems was considered a significant improvement to the traditional blackboard system. The technology was welcomed by today's MTV

generation with no hesitation. An extension of this is to use web browsers to deliver instruction. So far, no one at CCU has turned to Web browsers to present their lectures. Some have made instructional materials like lecture slides (possibly in Microsoft PowerPoint or as a postscript file) available on-line. Some professors have printed out Web pages for use in their lectures. The author has done this, whenever appropriate, and has also made it a point to include a list of resources for all upper level classes being taught in each semester (see Figure 4).

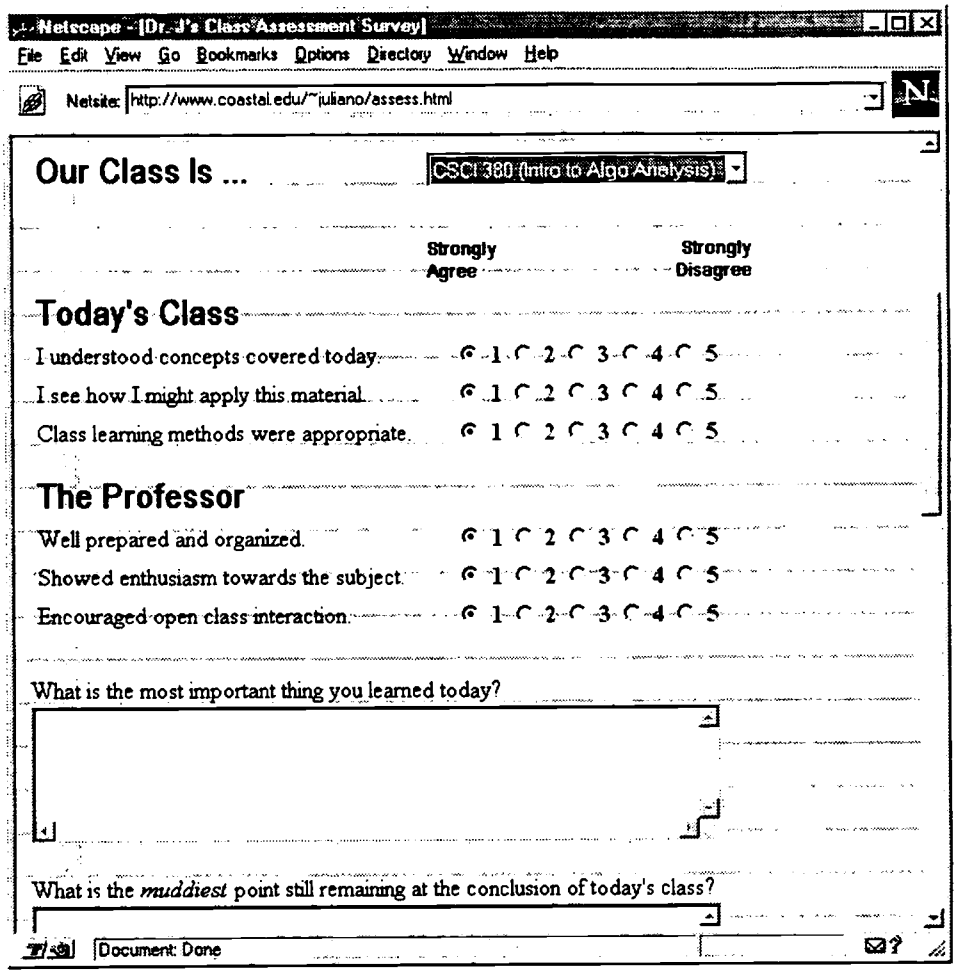

Figure 5 A sample class assessment form.

"3. Web-based courseware seems to better engage the more motivated students, and they end up making a contribution to the curriculum." (Bothun, 1996)

Web-based courseware includes course materials developed by both the professor and any of the students enrolled in the class. Assignments are given on the Web and students may set up their own Web pages featuring any information they found themselves. The author cannot support the above statement since web-based courseware have not been developed at CCU, thus far.

"4. The use of technology in teaching facilitates the development of a dynamic core-course curriculum, which can react almost instantaneously to feedback from students and other professors." (Bothun, 1996)

Syllabus sharing is something educators have been using the Web for. It is very likely that someone has posted on the Internet a syllabus for a similar course one intends to teach. Individuals around the globe post their most recent syllabi and other course-specific materials. One can assess their current syllabi by comparing it to others around the world. In one occasion, a professor from another University got in touch with the author asking permission to use his Computer Graphics syllabus in designing their own course. The author has also used the Web to collect information on designing a syllabus for a class in Analysis of Algorithms.

Another clear advantage of Web-based technology is the provision of a medium for immediate feedback from students. The author has successfully used a class assessment form (see Figure 5) that his students can use anytime during a semester to send feedback, comments, suggestions, questions, etc. This form was based on the "Minute Paper" used by Chizmar & Williams (1996). In this arrangement, the student is allowed to assess any particular class by commenting about how the course is going and how the professor taught that day. There are also textboxes to indicate both the most important thing(s) learned and any unclear or still misunderstood point in that day's class. The professor can then use this information to adjust lectures and class discussions accordingly. This can be done as early as the next class period.

4.2 Disadvantages of Power Pedagogy

"1. Alienation of some students." (Bothun, 1996)

Unfortunately, the availability of electronic notes, graphs, images, sound bytes, animations, etc. does not necessarily mean that students will access them and use them to supplement the learning process. Retrieving this information requires the correct hardware and software. At CCU and at other universities one cannot assume that each student has access to a computer at home. Students who have to access the Web through campus labs tend to consider this a hassle, specially if campus equipment is inadequate. Available hardware (in particular, the amount of main memory) seems to be the next biggest problem. Graphical information use up a lot of bandwidth and hence a lot of memory. This makes them practically inaccessible in older machines.

"2. Campus infrastructure needs." (Bothun, 1996)

The same hardware and software concerns in the previous item can plague campuses. A University's dedication to quality academic support, the state of campus network technology, available in-campus networking and technology expertise, etc. - these are all factors that could hinder the use of instructional technology. From an administrative viewpoint, some people find it even difficult to see the financial feasibility of making such technology available.

"3. Instructor preparation time." (Bothun, 1996)

The author has received comments such as "I don't have time to do all that" or "Where do you find the time to do all that?", among others. Admittedly, the use of instructional technology may take more time than traditional methods. Take for example the use of presentation packages like Microsoft PowerPoint. Although the use of overhead projectors may, in fact, improve the delivery of instruction, the preparation time may be a serious consideration specially in cases where the

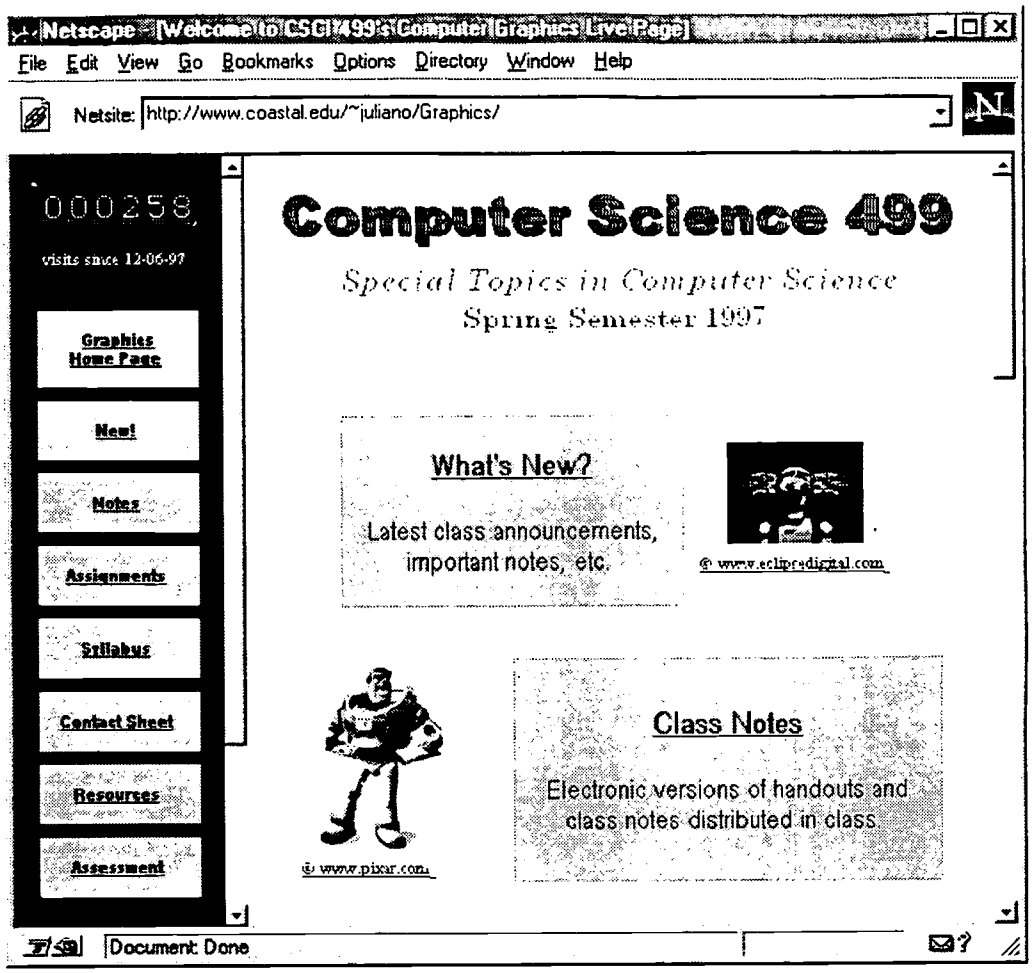

Figure 6 Using a standard template to facilitate Web page construction.

professor has to prepare everything from scratch. Most textbooks come with instructors' supplements that include transparency masters, and so this may be workable alternative.

Another example is the use of Web-based technology to supplement classroom discussion. Similar to the use of overhead projectors, the long preparation time only occurs initially and once material has been developed or a methodology constructed, then preparation time is reduced. The author currently uses a standard template similar to that in Figure 6 to facilitate Web page construction. Compare Figure 6, for example, to Figures 2 to 4. Of course, instructor preparation time also depends on the number of features one puts on their Web pages.

5. Summary and Conclusions

One cannot take extremes and either just embrace technology and welcome it into the classroom as a teaching/learning supplement, or just shun it completely as being evil! Although it seems clear to the author that the use of instructional technology in today's classrooms is the way to go, the author also is cautious in making recommendations to colleagues, peers, and others. A number of issues may need to concern us all. Perhaps the most important is the exponential growth rate in technology and the amount of online information (Berghel, 1997) that makes it difficult for everyone to keep

up with the pace. There will always be students and/or faculty with substandard computing equipment - insufficient hardware that is incapable of rendering the kind of graphics and animation everyone is getting hyped about. Not everyone will have the sound card required to listen to that audio clip. Not everyone will have the memory to handle multiple frames on web pages. And not everyone will have a Java-enabled web browser. Indeed, a picture paints a thousand words, but a graphic image tends to be an order more than a thousand bytes! The amount of graphical information in a Web page has to be considered when designing pages for use as instructional support. Some people have opted to put both text-based and graphics-based versions of their pages depending on their local hardware capabilities or user preferences. Information overload, on the other hand, results from there being too much information available online (Berghel, 1997). This raises questions of Internet credibility (Blumenthal, 1997) - there is also too much useless garbage out there! Other Internet concerns include security and privacy, policies on self-expression, etc. but these are beyond the scope of the paper.

There is a lot of potential for learning and for intellectual growth in the use of instructional technology. Support for hypermedia documents will continue to improve (Bieber & Vitali, 1997). Nonetheless, one has to get involved in Web-based technology with caution and concern, realizing its capabilities and limitations. Hence, one is to expect varying degrees of Web usage by faculty when it comes to instructional support. The first step is to provide the necessary training required to gain competence with networking and Internet technology. There will be resistance to this. At the other end, one can get involved in Web programming to design full-featured pages. This requires knowledge of new paradigms and skills (Yourdon, 1996): knowledge of HTML, programming CGI scripts, Java, etc. One can avoid having to learn all this by concentrating on developing skills in using Web browser plug-ins and tools.

Power pedagogy through the use of instructional technology can increase faculty productivity and can accommodate more students with existing facilities. In this "the network is the computer" society we live in, client/server deployment sets individuals even further from where the actual computation takes place thereby improving the virtual classroom experience. We must harness this network technology and use it as instructional support in our classrooms. This way, students are required to use the same technology they are expected to be familiar with when they graduate.

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